

# The Early Warning Indicator System: Identifying High School Students at Risk of Not Graduating on Time

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## What is the Early Warning Indicator System?

The Early Warning Indicator System (EWIS) assigns students who were reported as officially enrolled<sup>1</sup> in ninth grade by local school districts at the beginning of the 2011-12 school year one of five risk levels (*Very High Risk*, *High Risk*, *Borderline*, *At Risk*, or *Low Risk*) based on their grade 8 MCAS results, grade 8 attendance rate, age as of September 1, 2011, and cumulative number of in- and out-of-school suspensions in the 2009-10 and 2010-11 school years. The EWIS is intended to be used by the district as a starting point for identifying and supporting students who may be at risk of not graduating on time from high school.

Detailed rosters for these students are provided to the district in a Microsoft Excel workbook via its Accountability 2011 Drop Box in the Massachusetts Department of Elementary and Secondary Education's (ESE's) online Security Portal. A tool that automatically calculates risk levels for students who are not listed on the roster, the "EWIS Risk Calculator", is also provided.

Research is clear that a variety of factors contribute to a student's likelihood of not graduating on time. Because the EWIS risk levels are calculated using statewide data, the district should also use local data to identify and support students, including, but not limited to, information on course grades, course completion rates, and freshman year attendance rates.

## How were the risk levels determined?

ESE used data from the 2008, 2009, and 2010 high school graduation cohorts to evaluate the connection between a student's middle school performance and whether they graduated on time. After considering a variety of models, ESE identified one consisting of five factors that, taken together, predicted with a substantial degree of reliability whether a student graduated on time:

1. The student's eighth grade MCAS mathematics score (all three cohorts);
2. The student's seventh grade (2008 and 2009 cohorts) and eighth grade (2010 cohort) MCAS English language arts (ELA) score;
3. The student's attendance rate in eighth grade;
4. The total number of times the student was suspended (either in or out of school) in seventh and eighth grade; and
5. The student's age following the end of eighth grade.

While each of the indicators is predictive of on-time graduation for students statewide, ESE found that the degree of predictability of individual indicators differed somewhat for students residing in urban communities versus students who reside in suburban or rural communities. As a result, risk levels were established separately for these populations in proportion to their actual on-time graduation rates. For example, the calculations used to assign urban students a risk level of *Very High Risk* were based on an analysis of students whose collective on-time graduation rate was 19.1 percent. Suburban and rural students assigned this risk level had a collective on-time graduation rate of 23.3 percent. (See Table 6 at the end of this document for a list of the Commonwealth's 24 urban districts.)

## What information is included on my district's 2011-12 roster?

Each roster contains identifying information, MCAS results, attendance data, and suspension data for each individual student who is enrolled in ninth grade in the district as of the Oct 2011 Student Information Management System (SIMS) collection.

Specifically, risk levels assigned in the rosters are based on the five data elements below:

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<sup>1</sup> For enrollment definitions, please consult the Student Information Management System (SIMS) Data Handbook at <http://www.doe.mass.edu/info/services/data/sims/>.

1. Spring 2011 grade 8 MCAS mathematics scores;
2. Spring 2011 grade 8 ELA scores;
3. 2010-11 grade 8 attendance rate;
4. Number of in-or out-of-school suspension incidents in 2009-10 grade 7 and 2010-11 grade 8;
5. Age as of September 1, 2011.

In addition to these five indicators, the rosters include other descriptive information drawn from 2011-12 SIMS and MCAS data, including: the student's name, gender, race/ethnicity, the school and district they were enrolled in as of June 2011, their town of residency as of Oct 2011, the student's mobility data, the student's growth percentiles in mathematics and ELA, if available, and whether they received free or reduced price lunch, special education services, and/or were identified as limited English proficient (LEP) in 2010-11.

Please refer to Table 5 at the end of this document for the complete list of variables included on each roster.

### Were students with missing information assigned risk levels?

Yes. All students who were reported as enrolled in grade 9 in Massachusetts schools as of October 1, 2011 were calculated an age based on the student's date of birth, and grade 7 and 8 suspension data (the default being no suspensions). However MCAS or attendance data were incomplete for some students. In these cases, ESE generated imputed (estimated) MCAS scores and attendance rates for students who were missing these data. The imputed values allowed ESE to assign risk levels to every student on the roster, even if they were missing some data.

To provide additional context, each student record, whether based on actual or imputed values, also contains a "probability" variable (represented as a number between 0 and 1) which gives the student's predicted probability of graduating on time based on their eighth grade data. The higher the value, the more likely the student will graduate on time; the lower the value, the more likely the student will not graduate on time.

Taken together, these data give districts information they need to begin a more thorough inquiry into the interventions, supports, and unique circumstances of each student. For reference, the roster contains three "flag" variables indicating if a student lacked MCAS or attendance data and as a result was assigned imputed values for one or more of these variables.

### Do the student groups at each risk level share common characteristics?

Generally speaking, students assigned lower risk levels had higher MCAS scores, higher attendance rates, lower incidents of suspension, and are closer to age 14 than students assigned to higher risk levels, who tended to have inverse characteristics.

Tables 1 and 2 below display the characteristics of the 28,621 ninth grade students from urban communities and the 53,093 students from suburban and rural communities who did not have missing data and were assigned a risk level for 2011-12. For example, the 9,281 students from urban communities assigned to the *Very Low Risk* category had, on average, an ELA scaled score of 252<sup>2</sup>, a mathematics scaled score of 248, an eighth grade attendance rate of 97 percent, were rarely suspended as seventh or eighth graders, and were about 14 and a half years of age. Conversely, the 1,115 students from urban communities assigned to the *Very High Risk* category had, on average, an ELA scaled score of 223, a mathematics scaled score of 214, an eighth grade attendance rate of 78 percent, were suspended about 5 times over seventh and eighth grade, and were about 15 and a half years of age. It is important to keep in mind that these figures are only averages; for example, there are students assigned very low risk levels with poor MCAS scores and vice-versa.

### How accurate is the EWIS in predicting on-time graduation?

As stated previously, ESE used actual data from the 2008, 2009, and 2010 high school graduation cohorts to evaluate the connection between each student's middle school performance and whether they graduated on time.

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<sup>2</sup> Average MCAS scores rounded to the nearest even number.

In turn, this information was then used to estimate the likelihood that a student enrolling in ninth grade in the 2011-12 school year will graduate four years later.<sup>3</sup>

Tables 3 and 4 display the actual on-time graduation rates for all of the students in the 2008, 2009, and 2010 high school graduation cohorts whose middle school data from the 2003-04, 2004-05, and 2005-06 school years, respectively, were used in the model.

### **Can I assign a risk level to a student who is new to the district?**

Yes. ESE has developed the “EWIS Calculator” in Microsoft Excel for this purpose. As long as the student was enrolled in a Massachusetts school in 2010-11 and data are available for that student from that year, districts can use the spreadsheet to plug in information for all of the eighth grade data elements (i.e., MCAS ELA, MCAS mathematics, attendance, suspensions, or age). The calculator will automatically generate a risk level for the student using the same algorithm used to generate risk levels for the student on the district’s roster.

There are separate calculators for students whose town of residence is urban and for those whose town of residence is suburban or rural. Within those, there are different calculators for students missing specific data elements. Because the rosters were generated by district—as opposed to town of residence—rosters for some districts contain data for both urban and non-urban students (e.g., an “urban” student living in Boston may attend school in a suburban community). It is therefore important to first identify whether a student’s town of residence is urban or non-urban and then choose the appropriate calculator.

### **Who can access the rosters?**

Because the rosters contain student-level data, only district staff assigned the “Accountability – District” security role may access these data. This security role is assigned by the district’s Directory Administrator. For a list of directory administrators by district, please visit <http://www.doe.mass.edu/infoservices/data/diradmin/list.aspx>.

The rosters can be accessed via the Accountability 2011 Data Drop Box in Drop Box Central in the ESE Security Portal: <https://www4.doemass.org/auth/Login>.

### **Who may I contact if I have questions or need assistance?**

General questions about the EWIS, its use in identifying and supporting students, and ongoing networking activities and grant opportunities related to high school graduation initiatives may be directed to the Office of College and Career Readiness via email to [achievement@doe.mass.edu](mailto:achievement@doe.mass.edu).

Technical questions about the EWIS may be directed to the Office of School Improvement Grant Programs via email to [ayp@doe.mass.edu](mailto:ayp@doe.mass.edu).

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<sup>3</sup> No later than the summer of 2014

**Table 1: Characteristics of Student Groups by EWIS Risk Level  
(Students from Suburban and Rural Communities with Complete Data)**

N = 46,524 Students		Range	Average (Unrounded)	Standard Deviation
<b>Very Low Risk</b> N = 38,993 Students	Grade 8 ELA MCAS Scaled Score	212-280	253.06	9.74
	Grade 8 Math MCAS Scaled Score	206-280	248.13	16.92
	Grade 8 Attendance Rate	69-100	96.63	2.74
	Number of Suspensions <sup>4</sup>	0-24	0.04	0.34
	Age as of September 1, 2011	12-18	14.53	0.35
<b>Low Risk</b> N = 3,943 Students	Grade 8 ELA MCAS Scaled Score	208-278	237.25	11.07
	Grade 8 Math MCAS Scaled Score	202-274	222.49	9.79
	Grade 8 Attendance Rate	68-100	93.58	4.21
	Number of Suspensions	0-19	0.49	1.33
	Age as of September 1, 2011	13-17	14.70	0.44
<b>Borderline</b> N = 2,553 Students	Grade 8 ELA MCAS Scaled Score	206-278	233.01	12.22
	Grade 8 Math MCAS Scaled Score	202-274	219.22	8.71
	Grade 8 Attendance Rate	58-100	91.06	5.61
	Number of Suspensions	0-35	1.67	3.10
	Age as of September 1, 2011	13-17	14.80	0.51
<b>High Risk</b> N = 752 Students	Grade 8 ELA MCAS Scaled Score	206-264	228.14	12.20
	Grade 8 Math MCAS Scaled Score	200-262	217.13	7.68
	Grade 8 Attendance Rate	55-99	85.09	7.36
	Number of Suspensions	0-30	3.59	4.44
	Age as of September 1, 2011	14-17	14.94	0.53
<b>Very High Risk</b> N = 863 Students	Grade 8 ELA MCAS Scaled Score	204-268	228.72	13.68
	Grade 8 Math MCAS Scaled Score	202-262	216.90	9.18
	Grade 8 Attendance Rate	0-91	68.70	15.93
	Number of Suspensions	0-43	4.89	6.75
	Age as of September 1, 2011	14-17	15.03	0.61

<sup>4</sup> Suspension data are recorded by local school districts on a per-incident rather than a per-day basis; as such, one incidence of suspension may be defined as a single day to multiple days of suspension.

**Table 2: Characteristics of Student Groups by EWIS Risk Level  
(Students from Urban Communities with Complete Data)**

<b>N = 20,269 Students</b>		<b>Range</b>	<b>Average (Unrounded)</b>	<b>Standard Deviation</b>
<b>Very Low Risk</b> N = 9,281 Students	Grade 8 ELA MCAS Scaled Score	208-280	252.33	8.64
	Grade 8 Math MCAS Scaled Score	212-280	247.81	14.88
	Grade 8 Attendance Rate	82-100	96.93	2.60
	Number of Suspensions	0-20	0.10	0.63
	Age as of September 1, 2011	13-17	14.49	0.41
<b>Low Risk</b> N = 4,035 Students	Grade 8 ELA MCAS Scaled Score	210-272	241.46	8.41
	Grade 8 Math MCAS Scaled Score	204-268	225.61	10.48
	Grade 8 Attendance Rate	78-100	95.18	3.40
	Number of Suspensions	0-19	0.38	1.21
	Age as of September 1, 2011	13-17	14.65	0.53
<b>Borderline</b> N = 4,547 Students	Grade 8 ELA MCAS Scaled Score	204-264	232.15	11.64
	Grade 8 Math MCAS Scaled Score	202-268	219.14	8.27
	Grade 8 Attendance Rate	67-100	92.88	4.53
	Number of Suspensions	0-36	1.04	2.33
	Age as of September 1, 2011	12-17	14.82	0.60
<b>High Risk</b> N = 1,291 Students	Grade 8 ELA MCAS Scaled Score	206-260	226.41	11.23
	Grade 8 Math MCAS Scaled Score	202-268	215.70	6.88
	Grade 8 Attendance Rate	63-100	88.50	5.19
	Number of Suspensions	0-28	2.36	3.25
	Age as of September 1, 2011	14-20	15.05	0.66
<b>Very High Risk</b> N = 1,115 Students	Grade 8 ELA MCAS Scaled Score	204-260	223.84	11.05
	Grade 8 Math MCAS Scaled Score	202-248	214.35	6.46
	Grade 8 Attendance Rate	3-97	78.42	10.19
	Number of Suspensions	0-39	4.69	5.12
	Age as of September 1, 2011	14-18	15.30	0.70

**Table 3: Comparison of Actual On-Time Graduation Rates for Students in the 2008, 2009, and 2010 Graduating Cohorts and EWIS Risk Levels (Students from Suburban and Rural Communities)**

		Very Low Risk	Low Risk	Borderline	High Risk	Very High Risk	Total
Did Not Graduate On Time	Number of Students	3,169	2,697	3,711	1,570	696	11,843
	Percentage	<b>3.2%</b>	<b>15%</b>	<b>33.8%</b>	<b>59.7%</b>	<b>76.7%</b>	--
Graduated On Time	Number of Students	96,779	15,303	7,275	1,062	211	120,650
	Percentage	<b>96.8%</b>	<b>85%</b>	<b>66.2%</b>	<b>40.3%</b>	<b>23.3%</b>	--
Total	Number of Students	99,968	18,000	10,986	2,632	907	132,493
	Percentage	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	--

**Table 4: Comparison of Actual On-Time Graduation Rates for Students in the 2008, 2009, and 2010 Graduating Cohorts and EWIS Risk Levels (Students from Urban Communities)**

		Very Low Risk	Low Risk	Borderline	High Risk	Very High Risk	Total
Did Not Graduate On Time	Number of Students	850	1,804	6,177	3,054	3,408	15,293
	Percentage	<b>5%</b>	<b>13.6%</b>	<b>33.6%</b>	<b>60.7%</b>	<b>80.9%</b>	--
Graduated On Time	Number of Students	16,143	11,443	12,181	1,978	803	42,548
	Percentage	<b>95%</b>	<b>86.4%</b>	<b>66.4%</b>	<b>39.3%</b>	<b>19.1%</b>	--
Total	Number of Students	16,993	13,247	18,358	5,032	4,211	57,841
	Percentage	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	--

**Table 5: 2010-2011 EWIS Roster File Layout (Rosters Released in December 2011)**

Variable Name		Type	Width	Decimals	Definition
1	District_Code	String	4	0	4-digit district organization code based on October SIMS
2	SASID	String	10	0	state-assigned student identifier
3	First_Name	String	25	0	first name
4	Middle_Name	String	25	0	middle name
5	Last_Name	String	25	0	last name
6	School	String	8	0	8-digit code of enrolled school as of October 2011
7	Grade	String	2	0	enrolled grade as of October 2011
8	Truancy	Numeric	1	0	number of school days student was recorded as truant
9	Gender	String	1	0	gender
10	District_Name	String	30	0	name of enrolled district where student was assessed in the spring of 2011
11	School_Name	String	30	0	name of enrolled school based on June SIMS
12	Low_Income	Numeric	1	0	free/reduced price lunch status as of June 2011 (1 = y, 0 = n)
13	Limited_English_Proficient	Numeric	1	0	limited or formerly limited English proficient status as of June 2011 (1 = y, 0 = n)
14	Special_Education	Numeric	1	0	special education status as of June 2011 (1 = y, 0 = n)
15	MCAS_Alt_ELA	String	1	0	took ELA alternate assessment in eighth grade (1 = y)
16	Actual_Gr8_ELA_Scaled_Score	Numeric	3	0	Actual eighth grade ELA scaled score
17	Gr8_ELA_Performance	String	2	0	eighth grade ELA performance level: A = Advanced P = Proficient NI = Needs Improvement F = Failing W = Warning
18	Gr8_ELA_Growth_Percentile	Numeric	3	0	eighth grade ELA student growth percentile
19	MCAS_Alt_MTH	String	1	0	took math alternate assessment in eighth grade (1 = y)
20	Actual_Gr8_Math_Scaled_Score	Numeric	3	0	Actual eighth grade math scaled score

**Table 5: 2010-2011 EWIS Roster File Layout (Rosters Released in December 2011)**

Variable Name	Type	Width	Decimals	Definition	
21	Gr8_Math_Performance	String	2	0	eighth grade math performance level: A = Advanced P = Proficient NI = Needs Improvement F = Failing W = Warning
22	Gr8_MTH_Growth_Percentile	Numeric	3	0	eighth grade math student growth percentile
23	Race	String	1	0	race/ethnicity as of June 2011: A = Asian & Pacific Islander B = African American/Black H = Hispanic N = Native American W = White
24	Date_of_Birth	String	10	0	date of birth
25	Age	Numeric	4	2	Age as of September 1, 2011
26	Residency_Code	String	8	0	8-digit code of town of residency as of Oct 2011
27	Town_of_Residence	String	30	0	name of town of residency as of Oct 2011
28	Urban	Numeric	1	0	whether town of residency is urban (1 = y, 0 = n)
29	Gr8_Attendance	Numeric	3	0	actual or imputed eighth grade attendance rate
30	In_School_Suspension	Numeric	1	0	number of incidents coded as in-school suspension as per district definition
31	Out_of_School_Suspension	Numeric	1	0	number of incidents coded as out-of-school suspension as per district definition
32	Sum_School_Suspension	Numeric	3	0	sum of above two numbers
33	Gr8_ELA_Scaled_Score	Numeric	3	0	actual or imputed ELA scaled score
34	Gr8_Math_Scaled_Score	Numeric	3	0	actual or imputed math scaled score
35	Probability	Numeric	4	3	predicted probability of graduating on time based on their eighth grade data; the higher the value, the more likely the student will graduate on time; the lower the value, the more likely the student will not graduate on time (number between .0 and 1)
36	Risk_Level	String	25	0	risk level
37	Transfer_in_2010	Numeric	1	0	student transferred into a school after the beginning of the 2010 school year (1 = y, 0 = n)

**Table 5: 2010-2011 EWIS Roster File Layout (Rosters Released in December 2011)**

Variable Name		Type	Width	Decimals	Definition
38	Transfer_out_2010	Numeric	1	0	student transferred out of a school after the beginning of the 2010 school year (1 = y, 0 = n)
39	Stable_2010	Numeric	1	0	student remained in the same school for the entire 2010 school year (1 = y, 0 = n)
40	Transfer_in_2011	Numeric	1	0	student transferred into a school after the beginning of the 2011 school year (1 = y, 0 = n)
41	Transfer_out_2011	Numeric	1	0	student transferred out of a school after the beginning of the 2011 school year (1 = y, 0 = n)
42	Stable_2011	Numeric	1	0	student remained in the same school for the entire 2011 school year (1 = y, 0 = n)
43	Missing_ELA	Numeric	1	0	flag denoting whether student is missing eighth grade ELA data (1 = the data were missing and estimated data imputed as a substitute for the missing data; 0 = actual data displayed)
44	Missing_MTH	Numeric	1	0	flag denoting whether student is missing eighth grade math data (1 = the data were missing and estimated data imputed as a substitute for the missing data; 0 = actual data displayed)
45	Missing_Attendance	Numeric	1	0	flag denoting whether student is missing eighth grade attendance data (1 = the data were missing and estimated data imputed as a substitute for the missing data; 0 = actual data displayed)

**Table 6: List of 24 Urban Districts**

<b>District Code</b>	<b>District Name</b>
0035	Boston
0044	Brockton
0049	Cambridge
0057	Chelsea
0061	Chicopee
0093	Everett
0095	Fall River
0097	Fitchburg
0100	Framingham
0128	Haverhill
0137	Holyoke
0149	Lawrence
0153	Leominster
0160	Lowell
0163	Lynn
0165	Malden
0201	New Bedford
0236	Pittsfield
0243	Quincy
0248	Revere
0274	Somerville
0281	Springfield
0293	Taunton
0348	Worcester